MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

BBM3034 – BUSINESS MODELLING AND SIMULATION

(All section/Group)

1 March 2016
2.30 p.m. – 4.30 p.m.
(2 hours)

INSTRUCTION TO STUDENT

1. This question paper consists of 5 pages of 5 structured questions.
2. Marks are shown at the end of each question.
3. Set up the production model in Question 2 in Worksheet 1. Attach Worksheet 1 to your answer booklet.
4. Write all your answers in the answer booklet provided.

Answer all questions.

Question One

(a) Explain about the "discrete stochastic model" in business modelling. Give an example to support your answer. (4 marks)

(b) The outcome of a system is measured through its performance. What is the expected outcome of a system like the one you mentioned in (a)? (2 marks)

(c) Discuss why it is necessary to model real business problems with uncertainty. (4 marks)

(Total :10 marks)

Question Two

Read the problem below and answer the following questions.

Transporter is a company that produces 16G and 32G on-the-go (OTG) USB, namely X1 and X2, respectively. The unit price for X1 is RM23 and X2 is RM35. Transporter estimated its monthly demand on www.11street.my for X1 is 460 and X2 is 280 units, respectively. Transporter's operation manager informs you that in any typical month, it requires 2 units of materials to produce X1 and 3 units of materials to make X2 for the www.11street.my market. Each unit of materials costs RM5 and the funds available to buy materials for production to meet www.11street.my market is RM2,000 per month.

The labour cost to produce X1 requires 2 labour hours of moulding, 1 labour hours of assembling and 1 labour hours of quality checking and packaging. The labour cost to produce X2 requires 4 labour hours of moulding, 3 labour hours of assembling and 1 labour hours of quality checking and packaging. The labour cost of moulding is RM2 an hour, assembling is RM2 an hour, and quality checking and packaging of RM1 an hour respectively. The amount of monthly labour hours available for Transporter to produce the OTG USBs are 2,000 hours for moulding, 2,000 hours for assembling and 800 hours for quality checking and packaging. Assuming that Transporter does not hold any inventory, it wants to know how to optimise its production and maximise its profits by selling its OTG USBs online at www.11street.my.

Based on the problem above, answer the following questions:-

(a) State the mathematical objective function of this problem. (2 marks)

(b) State all the constraints to this problem. (2 marks)

(c) Set this production model in **Worksheet 1** (in page 5). **Attach Worksheet 1 to your answer booklet.** (2 marks)

(d) Based on Worksheet 1, how much material and moulding labour hours are used? (2 marks)

(e) Based on Worksheet 1, compute the total revenue of producing 460 X1 and 270 of X2 for www.11street.my market. (2 marks)

(f) Suppose that Transporter wants to produce a new 64G OTG USB. If the 64G OTG USB can be sold for RM52 and each 64G OTG USB requires 5 units of materials to produce, 5 labour hours of moulding, 4 labour hours of assembling and 2 labour hours of quality checking and packaging. Compute the unit profit margin for the new 64G OTG USB. (2 marks)

(Total : 12 marks)

Continued ...

Question Three

You are considering investing RM3 million in three stocks. The expected annual return, the worst-case annual return on each stock, and the "duration" of each stock are given as follows:-

	Stock 1	Stock 2	Stock 3
Expected Return	15%	11%	21%
Worst case Return	11%	10%	7%

The duration of a stock is a measure of the stock's sensitivity to interest rates. You want to maximize the expected return from your stock investments, subject to (i) the worst-case return of the stock portfolio must be at least 90% and (ii) at most 40% of the total amount to be invested in a single stock.

(a) What is the maximum amount you will invest in any one single stock? (2 marks)

(b) If the ratio of investment is 4:3:3 for Stock 1, 2 and 3, respectively, what is your worst-case annual return constraint for all 3 stocks. (3 marks)

(c) If the ratio of investment is 4:2:4 for Stock 1, 2 and 3, respectively, determine the company's maximised expected return on its total investment. (3 marks)

(Total: 8 marks)

Question Four

In the beginning of year 2010, The Jedi Order, an investment company, has RM300,000 to invest for the next four years. There are four possible investments labelled A through D. The timing of cash outflows and cash inflows for these investments is somewhat irregular. For instance, to take part in Investment A, cash must be invested at the beginning of year 1 and for every ringgit invested, there are returns of RM0.50 and RM1.00 at the beginings of years 2 and 3. Information for the other investment follows where all returns are per ringgit invested.

- Investment B: Invest at the beginning of year 2, receive returns of RM0.50 and RM1.00 at the beginings of years 3 and 4.
- Investment C: Invest at the beginning of year 1, receive returns of RM1.20 at the begining of year 2.
- Investment D: Invest at the beginning of year 4, receive returns of RM1.90 at the begining of year 5.

Assume that any amounts can be invested in these investments and the returns are the same for each ringgit invested. However, The Jedi Order has limited RM200,000 to be invested in any of the investments. The Jedi Order's objective is to maximise the amount of cash at the beginning of year 5. At the beginning of any year, the company can only invest the cash on hand, which includes returns from previous investments. Any cash not invested in any year can be put in a short-term money market account that earns 3% annually. **Worksheet 2** illustrates the set up for Jedi Order's financial investment strategy.

Based on these information and Worksheet 2, answer the following questions.

(a) Compute Jedi Order's return from investment for year 2 to year 5. (4 marks)

(b) How much is Jedi Order's cash after investment for year 3 and year 4? (2 marks)

(c) Calculate Jedi Order's maximum cash placed in the short-term money market account. (2 marks)

(d) What is Jedi Order's final cash at the beginning of year 5? (2 marks)

(Total : 10 marks)

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Worksheet 2 : Financial Investment

	A	B	C	D	E	F	G
1	Initial amount to invest		RM300,000				
2	Maximum per investment		RM200,000				
3	Interest rate on cash		3%				
4							
5	Cash outlays on investments (all incurred at beginning of year)						
6	Year	Investment A	Investment B	Investment C	Investment D		
7	1	RM1.00	RM-	RM1.00	RM-		
8	2	RM-	RM1.00	RM-	RM-		
9	3	RM-	RM-	RM-	RM-		
10	4	RM-	RM-	RM-	RM1.00		
11							
12	Cash returns from investments (all incurred at beginning of year)						
13	Year	Investment A	Investment B	Investment C	Investment D		
14	1	RM-	RM-	RM-	RM-		
15	2	RM0.50	RM-	RM1.20	RM-		
16	3	RM1.00	RM0.50	RM-	RM-		
17	4	RM-	RM1.00	RM-	RM-		
18	5	RM-	RM-	RM-	RM1.90		
19							
20	RM invested	RM200,000	RM200,000	RM100,000	RM200,000		
21		<=	<=	<=	<=		
22	Maximum per investment	RM200,000	RM200,000	RM200,000	RM200,000		
23							
24	Constraints on cash balance						
25	Year	Beginning cash	Returns from investments	Cash invested	Cash after investing		
26	1	RM300,000	RM-	RM300,000	RM-	>=	0
27	2	RM-	(a)	RM200,000	RM20,000	>=	0
28	3		(a)	RM-	(b)	>=	0
29	4		(a)	RM200,000	(b)	>=	0
30	5		(a)				
31							
32	Final Cash	(d)					

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Question Five

Shila has recently realized that she has only 20 years to save for her retirement. At the beginning of each year, she puts RM10,000.00 into her retirement account. At any point in time, all of Shila's retirement funds are tied up in the stock market. Suppose that the annual return on stocks follows a normal distribution with mean 15% and standard deviation 25%. Assume that if Shila reaches her goal before 20 years, she will stop investing. Shila's ending cash position for a given year is a function of her beginning cash position and the return on stocks for that year.

Based on the simulated rate of return in Worksheet 3, answer the following questions.

(a) What is Shila's ending cash position for year 1 and year 2? (2 marks)
(b) What is Shila's beginning cash position for year 2 and year 3? (2 marks)
(c) What is Shila's beginning and ending cash position for year 18 onwards? (4 marks)
(d) Based on your answers in (c), comment on Shila's retirement plan. (2 marks)

(Total : 10 marks)

Worksheet 3 : Shila's Retirement Plan

	A	B	C	D	E	F
1	Yearly investment	RM10,000.00				
2	Goal	RM1,000,000.00				
3						
4	Distribution of annual return on stocks (normal)					
5	Mean	15%				
6	Stdev	25%				
7						
8	Simulation of Amanda's cash position					
9	Year	Beginning	Return	Ending		
10	1	RM10,000.00	38.40%	(a)		
11	2	(b)	13.10%	(a)		
12	3	(b)	1.83%			
13	4	RM47,639.46	23.70%	RM58,930.01		
14	5	RM68,930.01	2.17%	RM70,425.79		
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26	17	RM736,022.00	2.58%			
27	18	(c)	-8.24%	(c)		
28	19	(c)	54.09%	(c)		
29	20	(c)	20.00%	(c)		

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Worksheet 1

	A	B	C	D	E	F
1						
2						
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